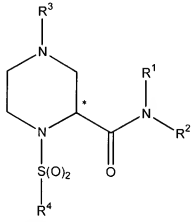
Amendments To The Claims

1. (Withdrawn) A method for treating infertility in a mammal, comprising administering to a mammal suspected of infertility a therapeutically effective amount of a compound of Formula I:



I

wherein R^1 and R^2 are independently selected from the group comprising or consisting of hydrogen, C_1-C_{12}-alkyl, C_2-C_{12}-alkenyl, C_2-C_{12}-alkynyl, wherein said alkyl, alkenyl, alkynyl chains may be interrupted by a heteroatom selected from N, O or S, aryl, heteroaryl, saturated or unsaturated 3-8-membered cycloalkyl, heterocycloalkyl, wherein said cycloalkyl, heterocycloalkyl, aryl or heteroaryl groups may be fused with 1-2 further cycloalkyl, heterocycloalkyl, aryl or heteroaryl group, an acyl moiety, C_1-C_{12}-alkyl aryl, C_1-C_{12}-alkyl heteroaryl, C_2-C_{12}-alkenyl aryl, C_2-C_{12}-alkenyl heteroaryl, C_2-C_{12}-alkynyl aryl, C_2-C_{12}-alkynyl heteroaryl, C_1-C_{12}-alkyl cycloalkyl, C_1-C_{12}-alkyl heterocycloalkyl, C_2-C_{12}-alkenyl cycloalkyl, C_2-C_{12}-alkenyl heterocycloalkyl, C_2-C_{12}-alkynyl cycloalkyl, C_2-C_{12}-alkynyl heterocycloalkyl, alkoxycarbonyl, aminocarbonyl, C_1-C_{12}-alkyl carboxy, C_1-C_{12}-alkyl acyl, aryl acyl, heteroaryl acyl, C_3-C_8-(hetero)cycloalkyl acyl, C_1-C_{12}-alkyl acyloxy, C_1-C_{12}-alkyl alkoxy, C_1-C_{12}-alkyl alkoxycarbonyl, C_1-C_{12}-alkyl aminocarbonyl, C_1-C_{12}-alkyl acylamino, acylamino, C_1-C_{12}-alkyl ureido, C_1-C_{12}-alkyl carbamate, C_1-C_{12}-alkyl amino, C_1-C_{12}-alkyl ammonium, C_1-C_{12}-alkyl sulfonyloxy, C_1-C_{12}-alkyl sulfonyl, C_1-C_{12}-alkyl sulfinyl, C_1-C_{12}-alkyl sulfanyl, C_1-C_{12}-alkyl sulfonylamino, or C_1-C_{12}-alkyl aminosulfonyl;

R^3 is C_1-C_{16}-alkyl, C_2-C_{16}-alkenyl, C_2-C_{16}-alkynyl, wherein said alkyl, alkenyl, alkynyl chains may be interrupted by a heteroatom selected from N, O or S, aryl, heteroaryl, saturated or unsaturated 3-8-membered cycloalkyl, heterocycloalkyl, wherein said cycloalkyl, heterocycloalkyl, aryl or heteroaryl groups may be fused with 1-2 further cycloalkyl, heterocycloalkyl, aryl or heteroaryl group, an acyl moiety, C_1-C_{16}-alkyl aryl, C_1-C_{16}-alkyl heteroaryl, C_2-C_{16}-alkenyl aryl, C_2-C_{16}-alkenyl heteroaryl, C_2-C_{16}-alkynyl aryl, C_2-C_{16}-alkynyl heteroaryl, C_1-C_{16}-alkyl cycloalkyl, C_1-C_{16}-alkyl heterocycloalkyl, C_2-C_{16}-alkenyl cycloalkyl, C_2-C_{16}-alkenyl heterocycloalkyl, C_2-C_{16}-alkynyl cycloalkyl, C_2-C_{16}-alkynyl heterocycloalkyl, alkoxycarbonyl, aminocarbonyl, C_1-C_{16}-alkyl carboxy, C_1-C_{16}-alkyl acyl, aryl acyl, heteroaryl acyl, C_3-C_8-(hetero)cycloalkyl acyl, C_1-C_{16}-alkyl acyloxy, C_1-C_{16}-alkyl alkoxy, C_1-C_{16}-alkyl alkoxycarbonyl, C_1-C_{16}-alkyl aminocarbonyl, C_1-C_{16}-alkyl acylamino, acylamino, C_1-C_{16}-alkyl ureido, C_1-C_{16}-alkyl carbamate, C_1-C_{16}-alkyl amino, C_1-C_{16}-alkyl ammonium, C_1-C_{16}-alkyl sulfonyloxy, C_1-C_{16}-alkyl sulfonyl, C_1-C_{16}-alkyl sulfinyl, C_1-C_{16}-alkyl sulfanyl, C_1-C_{16}-alkyl sulfonylamino, or C_1-C_{16}-alkyl aminosulfonyl;

R^4 is C_1-C_{12}-alkyl, C_2-C_{12}-alkenyl, C_2-C_{12}-alkynyl, wherein said alkyl, alkenyl, alkynyl chains may be interrupted by a heteroatom selected from N, O or S, aryl, heteroaryl, saturated or unsaturated 3-8-membered cycloalkyl, heterocycloalkyl, wherein said cycloalkyl, heterocycloalkyl, aryl or heteroaryl groups may be fused with 1-2 further cycloalkyl, heterocycloalkyl, aryl or heteroaryl group; and pharmaceutically acceptable salts thereof.

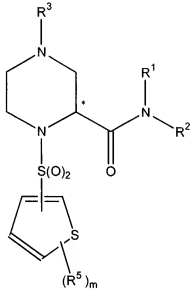
2. (Withdrawn) The method of claim 1, wherein R^1 is H.

3. (Withdrawn) The method of claim 1, wherein R^2 is selected from aryl, heteroaryl, 3-8 membered cycloalkyl and heterocycloalkyl.

4. (Withdrawn) The method of claim 1, wherein R^4 is selected from C_1-C_6-alkyl, amino, aryl, heteroaryl, 3-8-membered cycloalkyl and heterocycloalkyl.

5. (Withdrawn) The method of treatment of claim 1, wherein R^1 is H; R^2 is aryl; R^3 is selected from C_1-C_8-alkyl, C_1-C_8-acyl amino and C_1-C_8-alkyl acyl and R^4 is selected from C_1-C_6-alkyl, amino, aryl and heteroaryl.

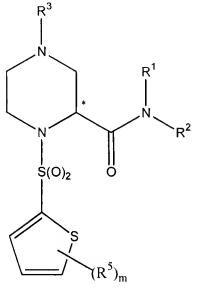
6. (Withdrawn) The method of claim 1 wherein the compound has the following Formula II:



II

wherein R^5 is independently halogen, hydroxy or the same as defined for R^1; m is an integer of from 0 to 4; and pharmaceutically acceptable salts thereof.

7. (Withdrawn) The method of claim 1 wherein the compound has the following Formula III:



III

wherein R^5 is independently halogen, hydroxy or the same as defined for R^1; m is an integer of from 0 to 4; and pharmaceutically acceptable salts thereof.

8. (Withdrawn) The method of claim 7 wherein R^1 is hydrogen and R^2 is other than hydrogen.

9. (Withdrawn) The method of claim 7 wherein R^2 is aryl or heteroaryl.

10. (Withdrawn) The method of claim 7 wherein R^3 is an n-alkyl group.

11. (Withdrawn) The method of claim 10 wherein R^3 is an alkyl having five or more carbon atoms.

12. (Withdrawn) The method of claim 1 wherein R^4 is optionally substituted alkyl, aryl, or heteroaryl.

13. (Withdrawn) The method of claim 1 wherein R^2 comprises a carbazolyl, tetrahydro-beta-carbolinyl or benzimidazolyl moiety.

14. (Withdrawn) The method of claim 1 wherein the compound of formula I is selected from the following group:

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridinyl-3-yl-1H-benzoimidazol-5-yl)-amide);

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)amide]-1-pentylamide;

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 1-ethylamide 3-[(9-ethyl-9H-carbazol-3-yl)amide];

{[3-(9-ethyl-9H-carbazol-3-ylcarbamoyl)-4-(thiophene-2-sulfonyl)-piperazine-1-carbonyl]-amino}acetic acid ethyl ester;

4-pentanoyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl) amide;

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl) amide;

4-dimethylsulfamoyl-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)amide] 1-pentylamide;

4-(1-methyl-1H-imidazole-4-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-pentylamide;

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxyclic acid 1-pentylamide 3-[(3-pyridin-4-yl-phenyl)-amide];

4-(thiophene-2-sulfonyl)-piperzine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-{[2-(1H-imidazol-4-yl)-ethyl]-amide};

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-oxo-2,3,4,9-tetrahydro-1H-beta-carbolin-6-yl)-amide;

4-heptyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl)-amide;

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-[(3-imidazol-1-yl-propyl)-amide]);

4-pentyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-oxo-2,3,4,9-tetrahydro-1H-beta-carbolin-6-yl)amide;

4-heptyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-oxo-2,3,4,9-tetrahydro-1H-beta-carbolin-6-yl)amide;

4-(3-methylsulfanyl-propyl)-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl)-amide;

4-(4-ethyl-furan-3-ylmethyl)-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl)-amide;

3-(9-ethyl-9H-carbazol-3-ylcarbamoyl)-4-(thiophene-2-sulfonyl)-piperazin-1-yl] acetic acid ethyl ester;

1-benzenesulfonyl-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

4-pentyl-1-thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

4-hexyl-1-thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

1-(4-fluoro-benzenesulfonyl)-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

1-(2-fluoro-benzenesulfonyl)-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

4-octyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

4-heptyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

1-dimethylsulfamoyl-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

1-(butane-1-sulfonyl)-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

4-(3-methylsulfanyl-propyl)-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-[(2-methoxy-ethyl)-amide];

4-octyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide; and pharmaccutically acceptable salts thereof.

15. (Withdrawn) A method for treatment of a subject suffering from or susceptible to a disease or disorder associated with phosphodiesterase PDE4, adenosine transporters, or prostanoid receptors, comprising administering to the mammal a therapeutically effective amount of a compound of claim 1.

16. (Withdrawn) The method of claim 15 wherein the mammal is a human.

17. (Withdrawn) The method of claim 16 wherein the mammal is a female.

18. (Withdrawn) The method of claim 17 wherein the mammal is suffering from an ovulatory disorder.

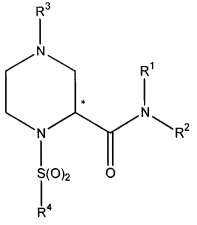
19. (Withdrawn) The method of claim 17 wherein the mammal is being treated with an assisted reproduction procedure.

20. (Withdrawn) The method of claim 17 wherein the mammal is undergoing in-vitro fertilization.

21. (Withdrawn) The method of claim 16 wherein the mammal is a male.

22. (Withdrawn) The method of claim 17 wherein the mammal is a male suffering from a spermatogenesis disorder.

23. (Previously Presented) A compound according to Formula I:



I

wherein R^1 is H;

R^2 is selected from aryl, heteroaryl, 3-8-membered cycloalkyl and heterocycloalkyl;

R^3 is selected from C_1-C_{16}-alkyl, C_2-C_{16}-alkenyl, C_2-C_{16}-alkynyl, monocyclic aryl, monocyclic heteroaryl, 3-8-membered monocyclic cycloalkyl, monocyclic heterocycloalkyl, acyl, C_1-C_{16}-alkyl aryl, C_1-C_{16}-alkyl heteroaryl, C_2-C_{16}-alkenyl aryl, C_2-C_{16}-alkenyl heteroaryl, C_2-C_{16}-alkynyl aryl, C_2-C_{16}-alkynyl heteroaryl, C_1-C_{16}-alkyl cycloalkyl, C_1-C_{16}-alkyl heterocycloalkyl, C_2-C_{16}-alkenyl cycloalkyl, C_2-C_{16}-alkenyl heterocycloalkyl, C_2-C_{16}-alkynyl cycloalkyl, C_2-C_{16}-alkynyl heterocycloalkyl, alkoxycarbonyl, aminocarbonyl, C_1-C_{16}-alkyl carboxy, C_1-C_{16}-alkyl acyl, aryl acyl, heteroaryl acyl, C_3-C_8-(hetero)cycloalkyl acyl, C_1-C_{16}-alkyl acyloxy, C_1-C_{16}-alkyl alkoxy, C_1-C_{16}-alkyl alkoxycarbonyl, C_1-C_{16}-alkyl aminocarbonyl, C_1-C_{16}-alkyl acylamino, acylamino, C_1-C_{16}-alkyl sulfinyl, C_1-C_{16}-alkyl sulfanyl, C_1-C_{16}-alkyl ureido, C_1-C_{16}-alkyl carbamate, C_1-C_{16}-alkyl amino, C_1-C_{16}-alkyl ammonium;

R^4 is selected from C_1-C_{12}-alkyl, C_2-C_{12}-alkenyl, C_2-C_{12}-alkynyl, aryl, heteroaryl, 3-8-membered cycloalkyl, heterocycloalkyl, and amino; and pharmaceutically acceptable salts thereof.

24. (Previously Presented) The compound of claim 23 wherein R^2 is aryl or heteroaryl.

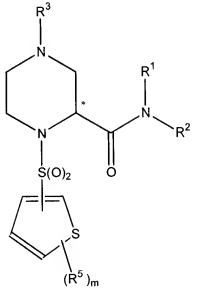
25. (Previously Presented) The compound of claim 23, wherein R^4 is selected from C_1-C_6-alkyl, amino, aryl, heteroaryl, 3-8-membered cycloalkyl and heterocycloalkyl.

26. (Previously Presented) The compound of claim 23, wherein R^2 is aryl; R^3 is selected from C_1-C_8-alkyl, C_1-C_8-acyl amino and C_1-C_8-alkyl acyl and R^4 is selected from C_1-C_6-alkyl, amino, aryl and heteroaryl.

27. (Previously Presented) The compound of claim 23, wherein R^2 is fused phenyl.

28. (Previously Presented) The compound of claim 23, wherein R^4 is thienyl.

29. (Previously Presented) The compound of claim 23 having the following Formula II:



II

wherein

R^5 is independently halogen or hydroxy; m is an integer of from 0 to 3; and pharmaceutically acceptable salts thereof.

30. (Previously Presented) The compound of claim 23 wherein R^2 comprises a carbazolyl, tetrahydro-beta-carbolinyl or a benzimidazolyl moiety.

31. (Currently Amended) The compound of claim 23 that is selected from the following group:

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridinyl-3-yl-1H-benzoimidazol-5-yl)-amide);

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)amide]-1-pentylamide;

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 1-ethylamide 3-[(9-ethyl-9H-carbazol-3-yl)amide];

~~{[3-(9-ethyl-9H-carbazol-3-ylcarbamoyl)-4-(thiophene-2-sulfonyl)-piperazine-1-carbonyl]-amino}acetic acid ethyl ester;~~

4-pentanoyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl) amide;

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl) amide;

4-dimethylsulfamoyl-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)amide] 1-pentylamide;

4-(1-methyl-1H-imidazole-4-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-pentylamide;

4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxyclic acid 1-pentylamide 3-[(3-pyridin-4-yl-phenyl)-amide];

~~4-(thiophene-2-sulfonyl)-piperzine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-{[2-(1H-imidazol-4-yl)-ethyl]-amide};~~

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-oxo-2,3,4,9-tetrahydro-1H-beta-carbolin-6-yl)-amide;

4-heptyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl)-amide;

~~4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-[(3-imidazol-1-yl-propyl)-amide]~~;

4-pentyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-oxo-2,3,4,9-tetrahydro-1H-beta-carbolin-6-yl)amide;

4-heptyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-oxo-2,3,4,9-tetrahydro-1H-beta-carbolin-6-yl)amide;

4-(3-methylsulfanyl-propyl)-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl)-amide;

4-(4-ethyl-furan-3-ylmethyl)-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (9-ethyl-9H-carbazol-3-yl)-amide;

3-(9-ethyl-9H-carbazol-3-ylcarbamoyl)-4-(thiophene-2-sulfonyl)-piperazin-1-yl] acetic acid ethyl ester;

1-benzenesulfonyl-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

4-pentyl-1-thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

4-hexyl-1-thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

1-(4-fluoro-benzenesulfonyl)-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

1-(2-fluoro-benzenesulfonyl)-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

4-octyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

4-heptyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

1-dimethylsulfamoyl-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide;

1-(butane-1-sulfonyl)-4-hexyl-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-

benzoimidazol-5-yl) amide;

4-hexyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

4-(3-methylsulfanyl-propyl)-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-4-yl-1H-benzoimidazol-5-yl) amide;

~~4-(thiophene-2-sulfonyl)-piperazine-1,3-dicarboxylic acid 3-[(9-ethyl-9H-carbazol-3-yl)-amide] 1-[(2-methoxy-ethyl)-amide];~~

4-octyl-1-(thiophene-2-sulfonyl)-piperazine-2-carboxylic acid (1-ethyl-2-pyridin-3-yl-1H-benzoimidazol-5-yl) amide.

32. (Previously Presented) A pharmaceutical composition comprising the compound of claim 31.

33. (Canceled)

34. (Previously Presented) A pharmaceutical composition comprising a pharmaceutically acceptable carrier and one or more compounds of claim 31.

35. (Original) A pharmaceutical composition of claim 34 wherein the compound is packaged together with instructions for use of the compound to treat infertility.

36. (Previously Presented) The compound of claim 29 wherein m is an integer of from 0 to 2